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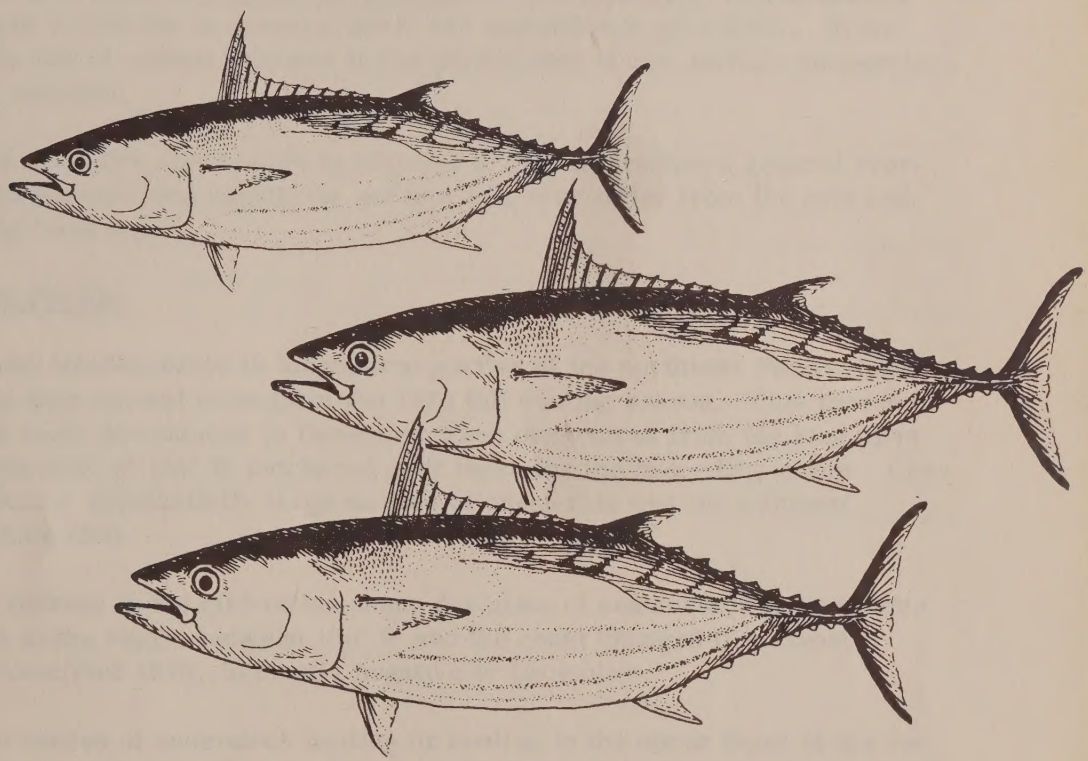
DECEMBER 1970

FISHING INFORMATION

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



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NARRATIVE DESCRIPTION OF OCEAN TEMPERATURE CONDITIONS

Salient features in the monthly distribution of sea surface temperature will be described for the northeastern and eastern tropical Pacific Ocean commencing with this issue of Fishing Information. When possible, we will attempt to relate these conditions to oceanographic and atmospheric processes. Eventually, prediction of certain features in the distribution of sea surface temperature will also be included.

The narrative description is intended to give the reader a general overview of ocean temperature conditions and how they may differ from the previous year and long term mean.

Northeastern Pacific

Ocean temperatures in the central portion of the northeast Pacific have been warmer than normal throughout the 1970 fall cooling season. This tendency became even more pronounced in December when departures from the long term mean in areas west of 155° W increased over those for the preceding month. Consequently, over a substantially large section of ocean this was the warmest December since 1961.

In contrast to the mid-ocean area, deviation of sea surface temperature from normal in the region between 150° W and the coast changed from mostly positive in November 1970, to mostly negative in December.

The causes of anomalous heating or cooling in the upper layer of the sea are not always easy to identify. In this case, however, the presence of abnormally high pressures over most of the offshore oceanic region, and the associated strong anticyclonic (clockwise) circulation, are unquestionably involved as principle contributing factors. The north-south axis of the high pressure pattern lies at about 155° W (see Figure 9). West of this axis the wind stress was from the south, contributing to northward transport of relatively warm water. East of the high pressure axis, the wind stress was from a northerly direction, contributing to southward transport of relatively cold water.

The unusually strong anticyclonic flow of air around the high pressure center also affected certain components of the heat exchange between sea and air in a way that amplified the effects of wind stress. Primarily, the higher moisture content and lower average speed of the southerly flow resulted in less evaporation

(and reduced loss of heat from the sea) west of the high pressure axis. Another factor was the lower temperature of the northerly winds flowing around the east side of the high pressure center, which caused greater loss of heat through conduction from the relatively warm sea surface. In brief, both evaporation and heat conduction acted to retard seasonal cooling in the region west of about 155° W and to intensify it east of this longitude.

Eastern Tropical Pacific

The dominant feature of the temperature pattern in the eastern tropical Pacific was the tongue of cold water stretching westward from South America along the equator. Temperatures in this tongue have for several months been below the long term normal and much below corresponding temperatures for 1969. The magnitude and extent of the abnormally cold equatorial water in December 1970 (Fig. 6) shows little change from previous months. Continued persistence of this condition, which most probably results from upwelling induced by strong southeast trade winds, would preclude any tendency toward El Niño conditions. Also, sea surface temperatures off the west coast of Baja California, out to 118° W were about 2° (Farenheit) below those in 1969 and they were slightly colder than the long term mean for the same area.

A large pool of cold water appears as a prominent feature (both in the charts of actual temperature and of departures from normal) offshore from the Gulf of Tehuantepec, reflecting a high frequency of northerly winds and consequent upwelling during the month.

Staff, Fishery-Oceanography Group
R. Michael Laurs, Leader

SEA SURFACE TEMPERATURE CHARTS, PACIFIC OCEAN
DECEMBER 1970

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National Weather Service, San Diego, California
National Ocean Survey, Pacific Marine Center, Seattle, Washington
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Fishing Vessel WEST POINT

Charts

Figure 1.--Mean sea surface temperature, eastern north Pacific Ocean. Squares show temperatures at weather ship stations. Numerals on shore are temperatures at coastal and lightship stations.

Figure 2.--Mean sea surface temperature chart, western north Pacific Ocean.

Figure 3.--Deviation of sea surface temperatures, eastern north Pacific Ocean from long term charts of H.O. 225. Hatched areas are colder in 1970.

Figure 4.--Deviation of sea surface temperatures, eastern north Pacific Ocean from those of December 1969. Hatched areas are colder in 1970.

Figure 5.--Mean sea surface temperature, eastern tropical Pacific Ocean. Numerals on shore are temperatures at coastal stations.

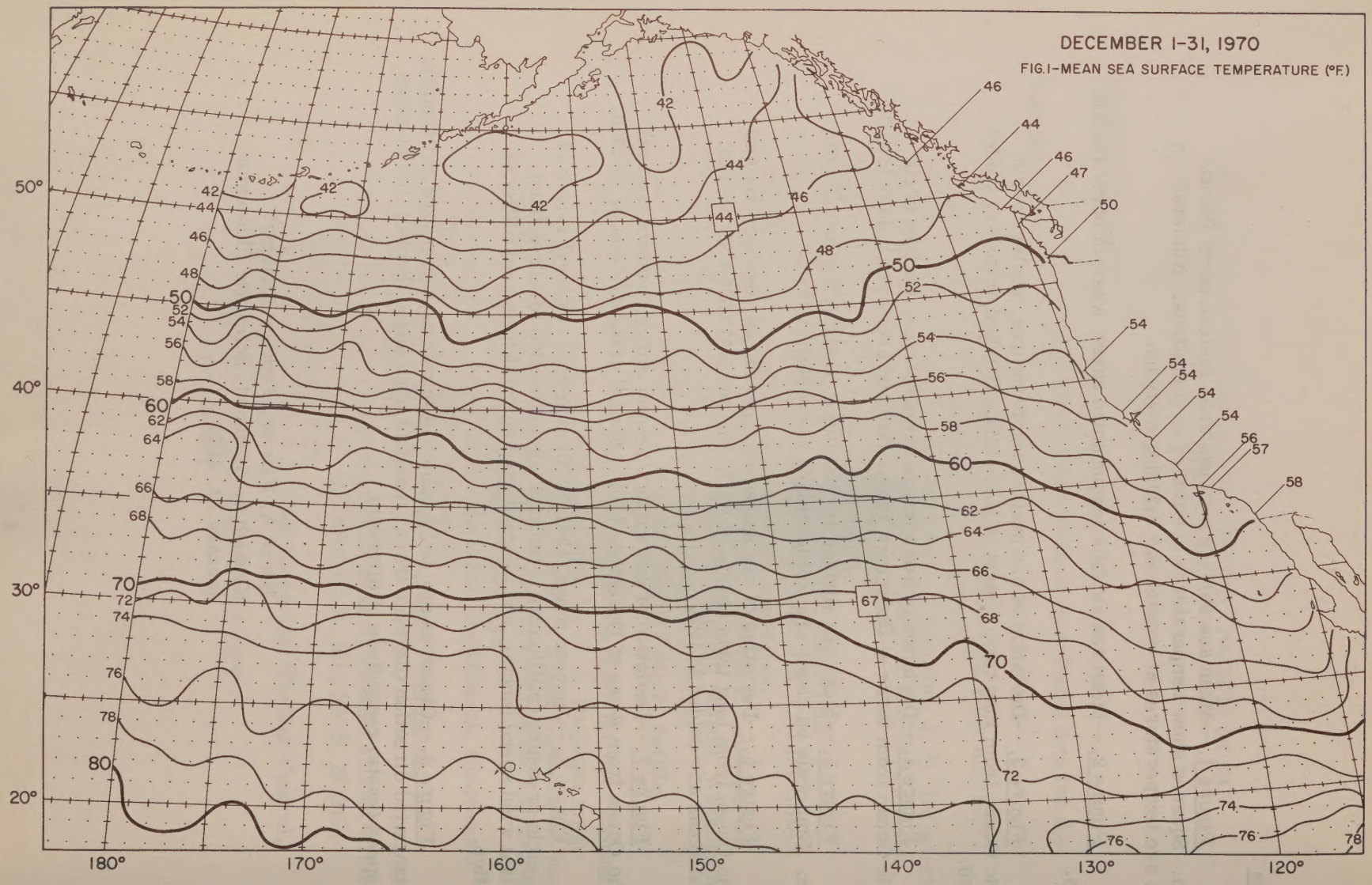
Figure 6.--Deviation of sea surface temperatures, eastern tropical Pacific Ocean from long term charts of H.O. 225 and NAVOCEANO sp-123. Shaded areas are colder in 1970.

Figure 7.--Deviation of sea surface temperatures, eastern tropical Pacific Ocean from those of December 1969. Shaded areas are colder in 1970.

Figure 8.--10-year mean (1961-1970) observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots), and average wind speed (knots) regardless of direction.

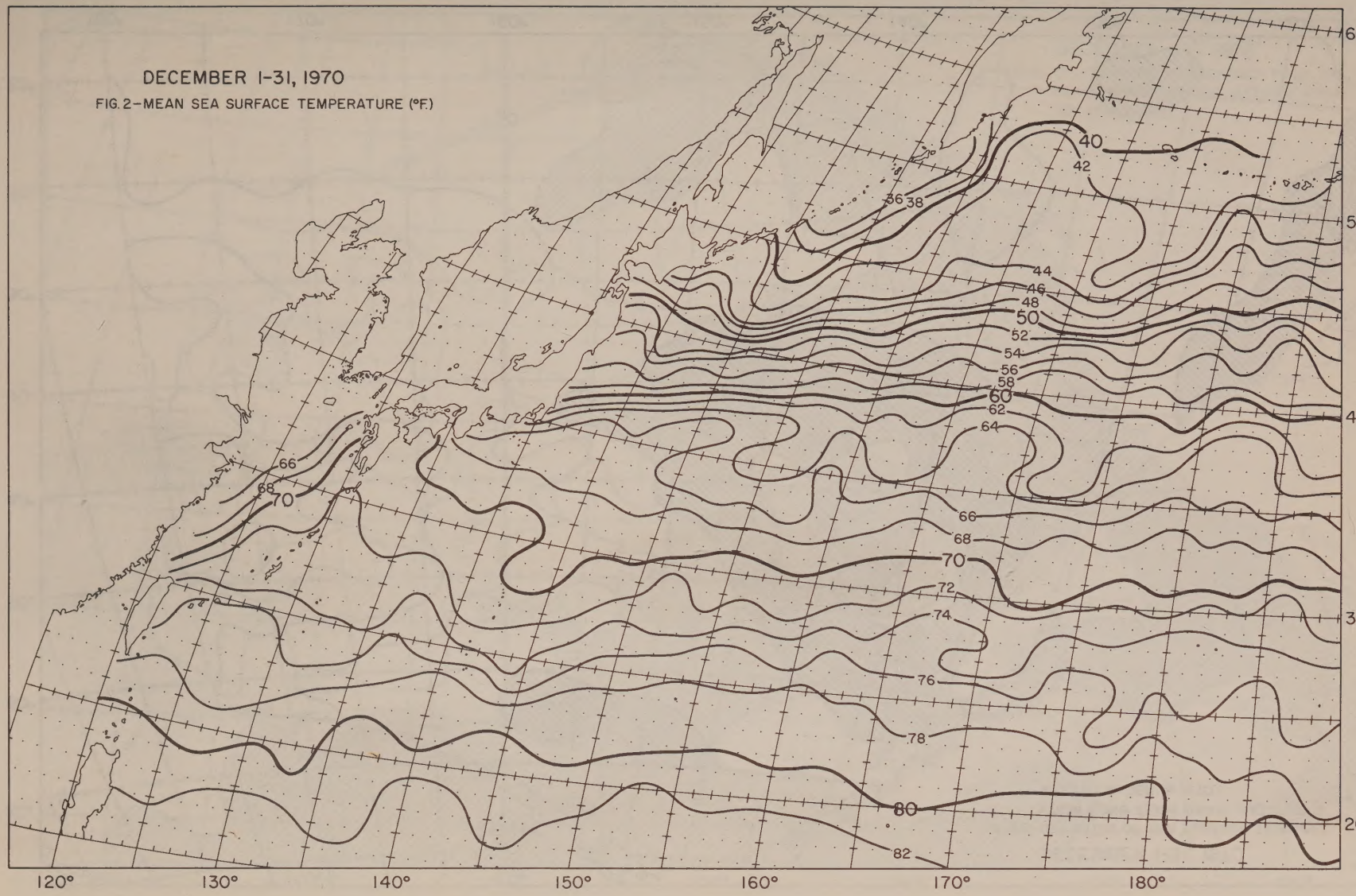
Figure 9.--Observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots), and average wind speed (knots) regardless of direction.

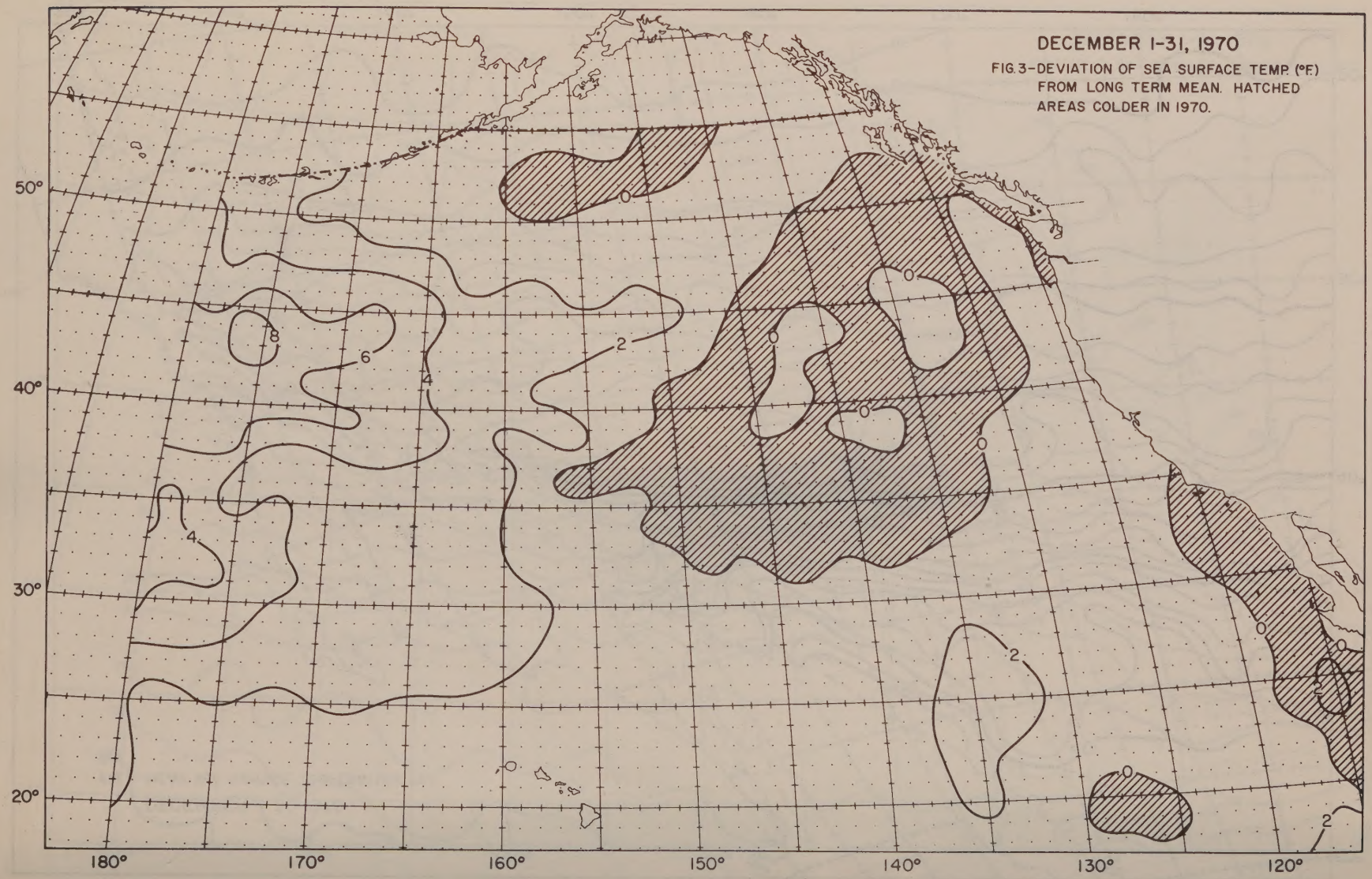
James A. Renner, Fishery Biologist
Kenneth S. Raymond, Scientific Illustrator
January 12, 1971

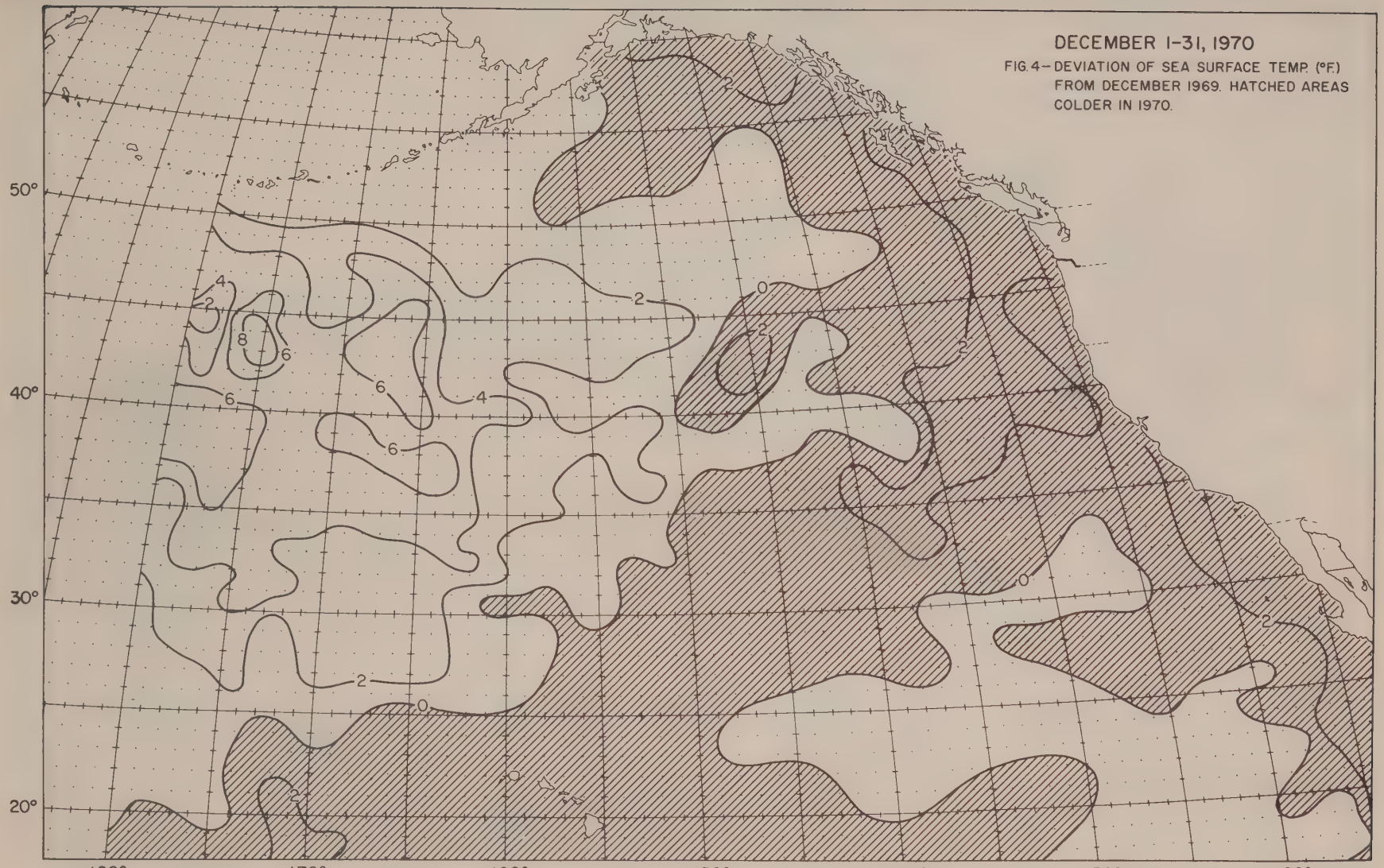

DECEMBER 1-31, 1970
FIG.1-MEAN SEA SURFACE TEMPERATURE (°F.)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°

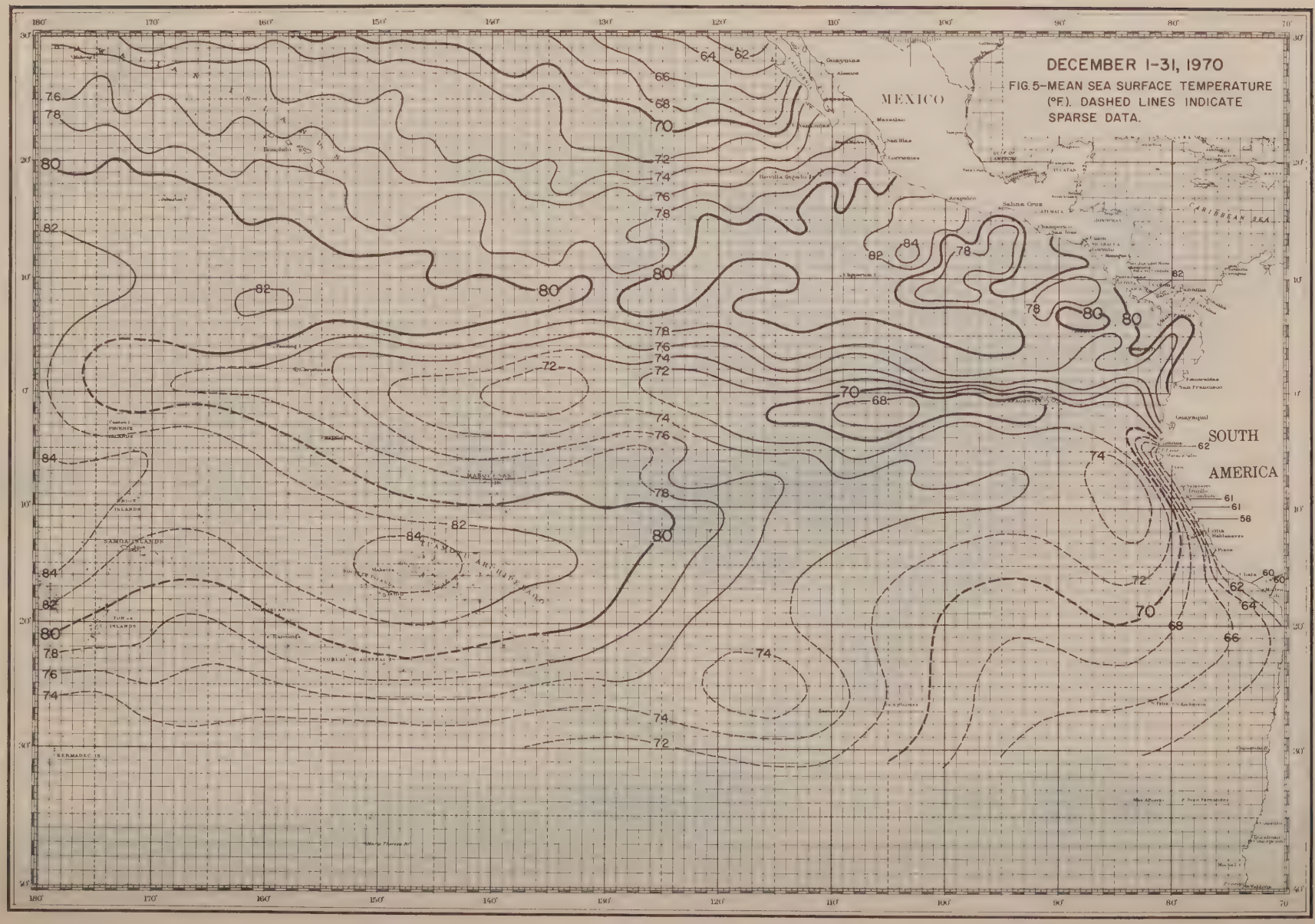
DECEMBER 1-31, 1970

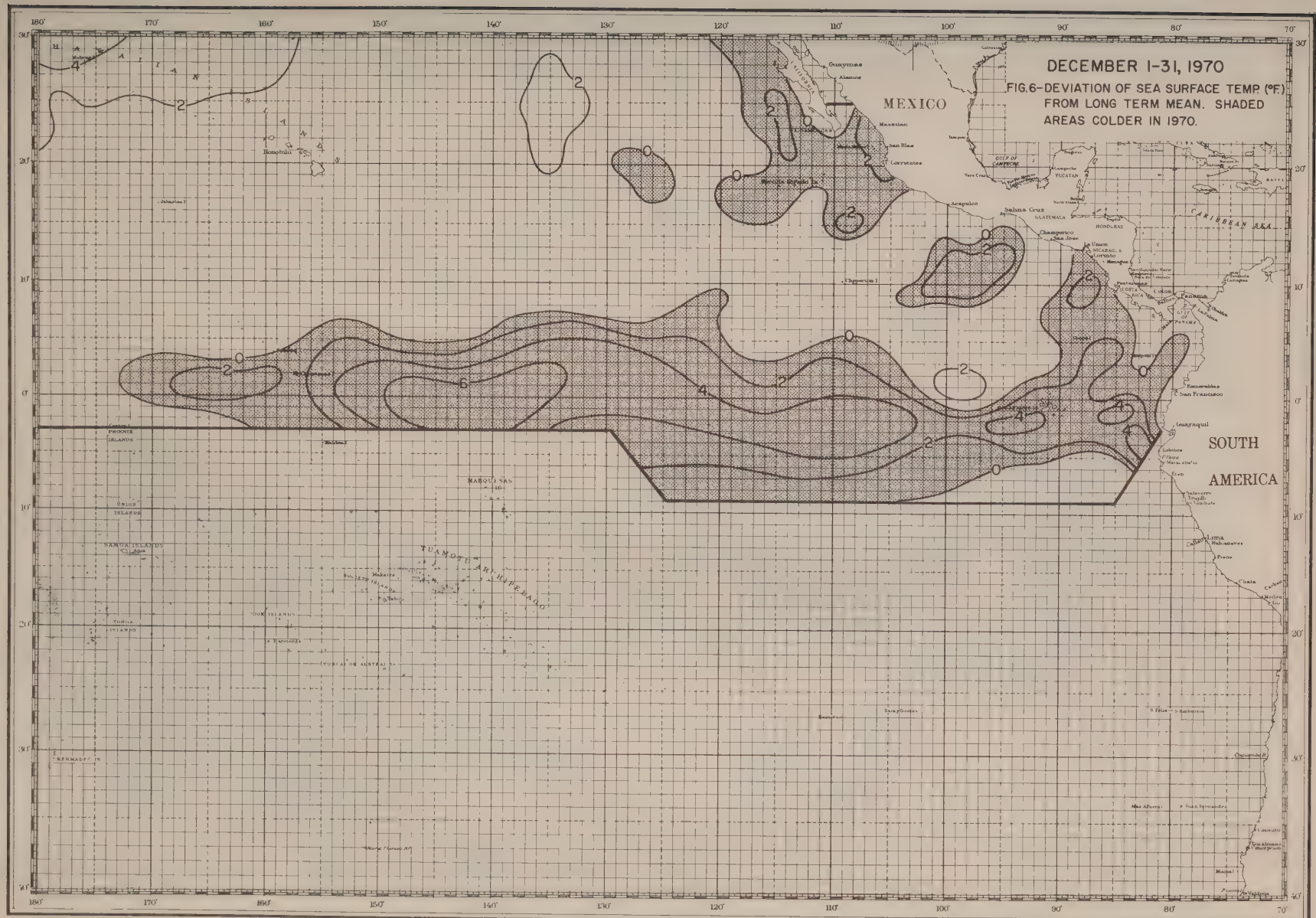
FIG. 2-MEAN SEA SURFACE TEMPERATURE (°F.)

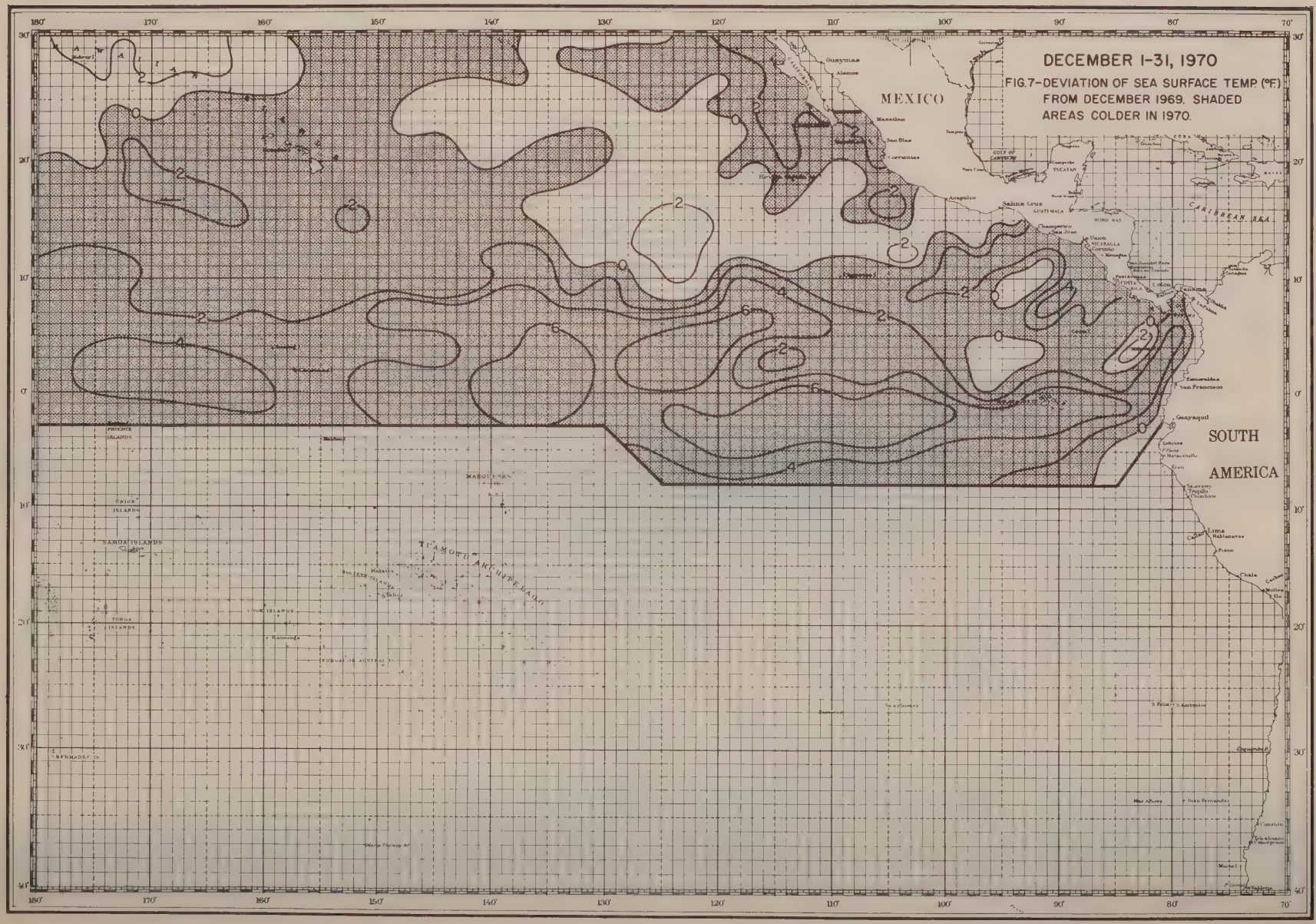


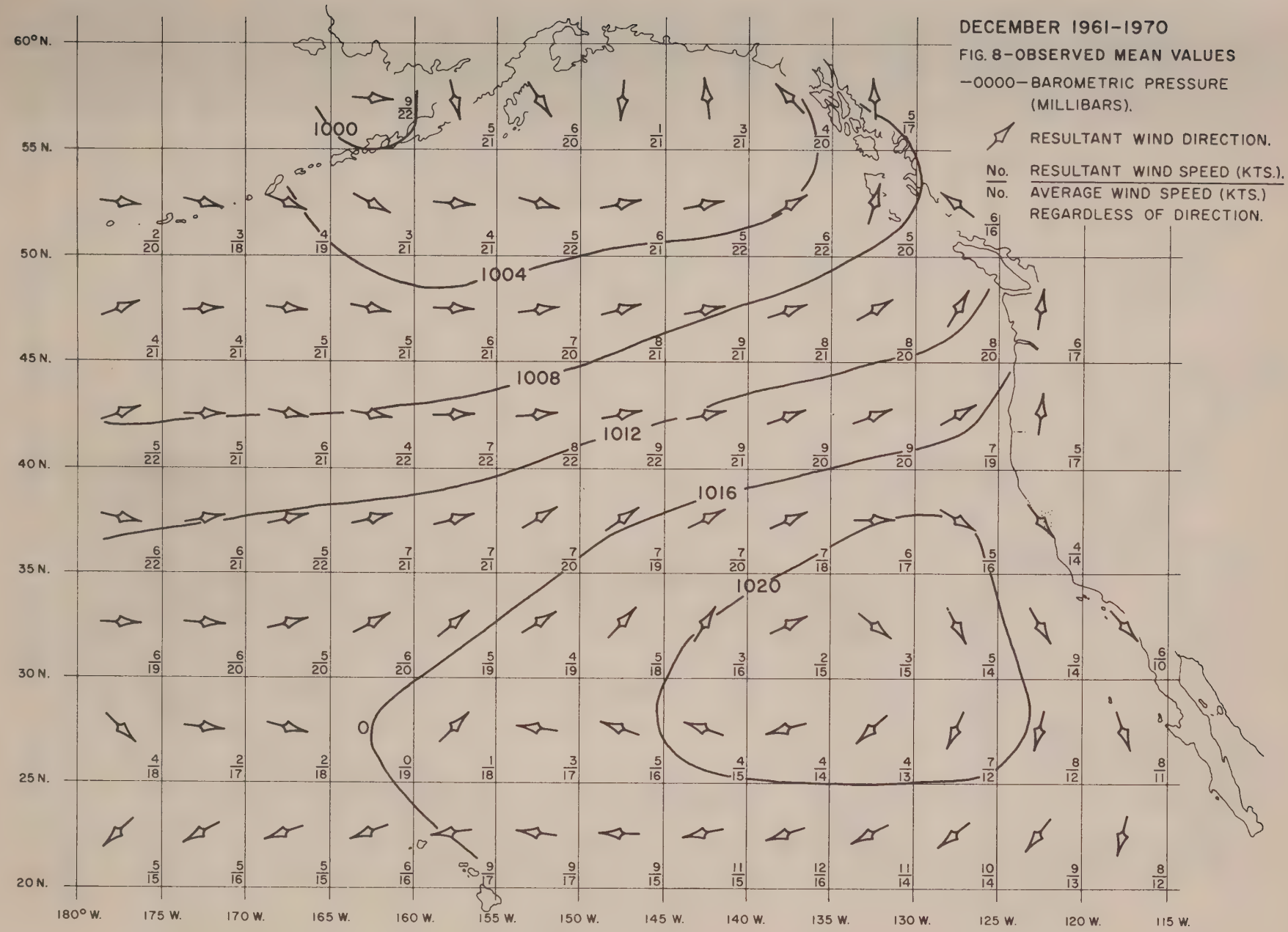

DECEMBER 1-31, 1970
FIG.3-DEVIATION OF SEA SURFACE TEMP. (°F) FROM LONG TERM MEAN. HATCHED AREAS COLDER IN 1970.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2
4
6
8

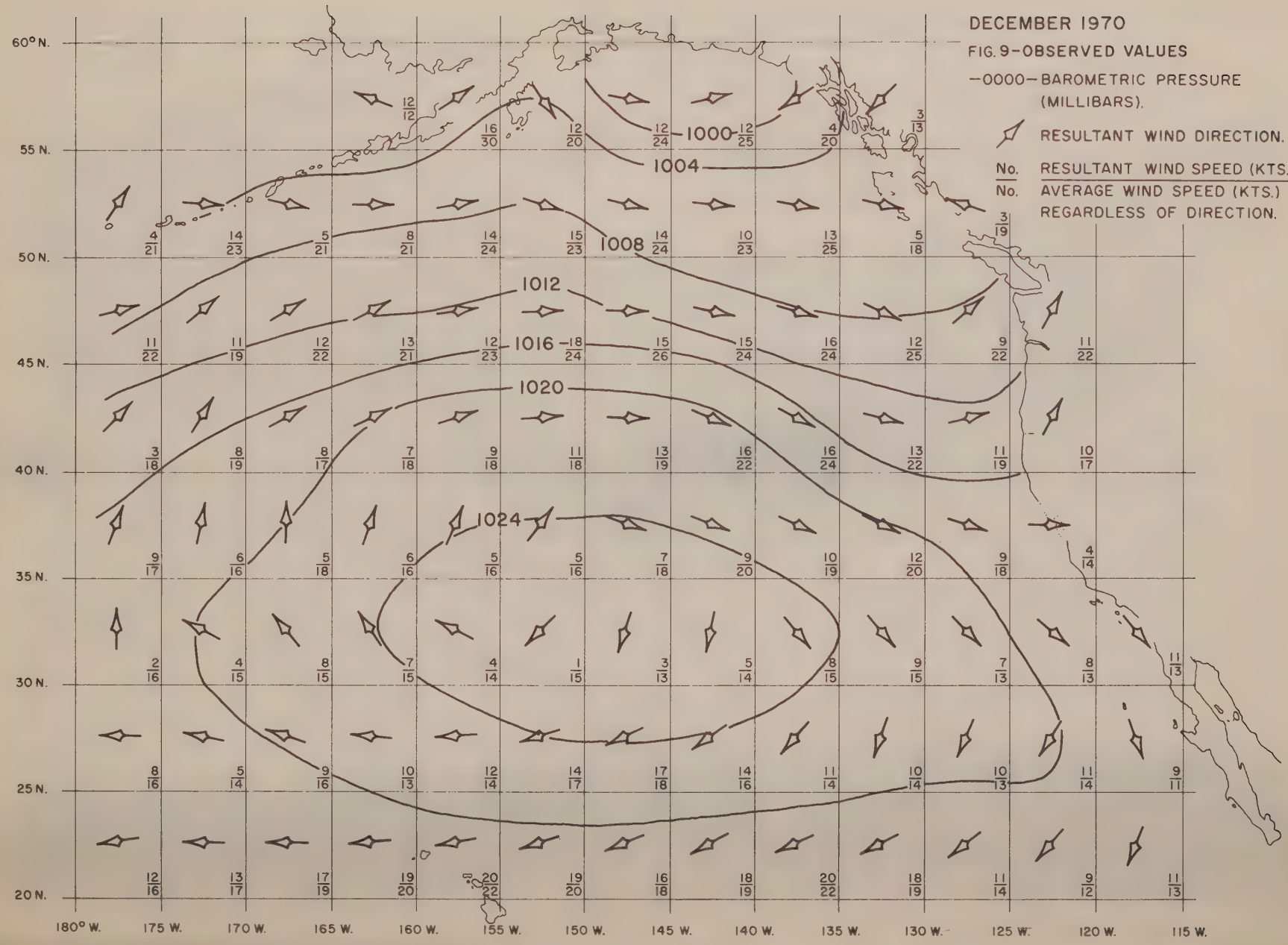

DECEMBER 1-31, 1970
FIG. 4 – DEVIATION OF SEA SURFACE TEMP. (°F.) FROM DECEMBER 1969. HATCHED AREAS COLDER IN 1970.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
4
2
8
6
6
6
4
6
2
0
2
0
2
2
0
2
2
0
2
2
0
2

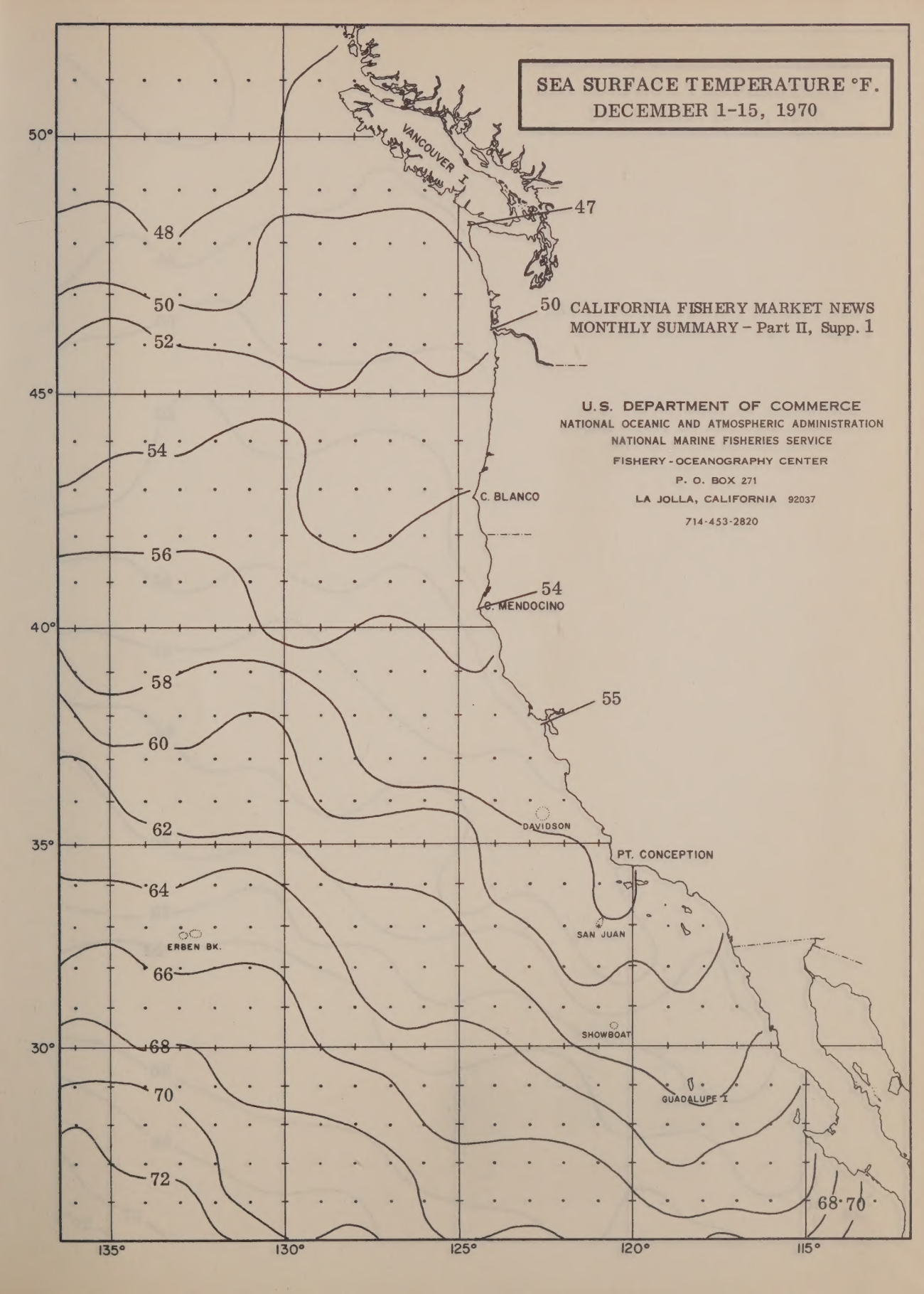

DECEMBER 1-31, 1970
FIG. 5-MEAN SEA SURFACE TEMPERATURE (°F). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
10°
20°
30°
40°


DECEMBER 1-31, 1970
FIG.6-DEVIATION OF SEA SURFACE TEMP. (°F.) FROM LONG TERM MEAN. SHADED AREAS COLDER IN 1970.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
TUAMOTU ARCHIPELAGO
MARQUESAS
Honolulu
Guaymas
Acapulco
Salina Cruz
Champerico
Guayaquil
Lima
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
10°
20°
30°
50°


DECEMBER 1-31, 1970
FIG.7-DEVIATION OF SEA SURFACE TEMP. (°F) FROM DECEMBER 1969. SHADED AREAS COLDER IN 1970.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GULF OF MEXICO
TUAMOTU ARCHIPELAGO
SAMOA ISLANDS
COOK ISLANDS
TONGA ISLANDS
PHOENIX ISLANDS
UNION ISLANDS
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
10°
20°
30°
40°


DECEMBER 1961-1970
FIG. 8-OBSERVED MEAN VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1000
1004
1008
1012
1016
1020
0
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


DECEMBER 1970
FIG. 9-OBSERVED VALUES
--0000-- BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1000
1004
1008
1012
1016
1020
1024
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.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SHOWBOAT
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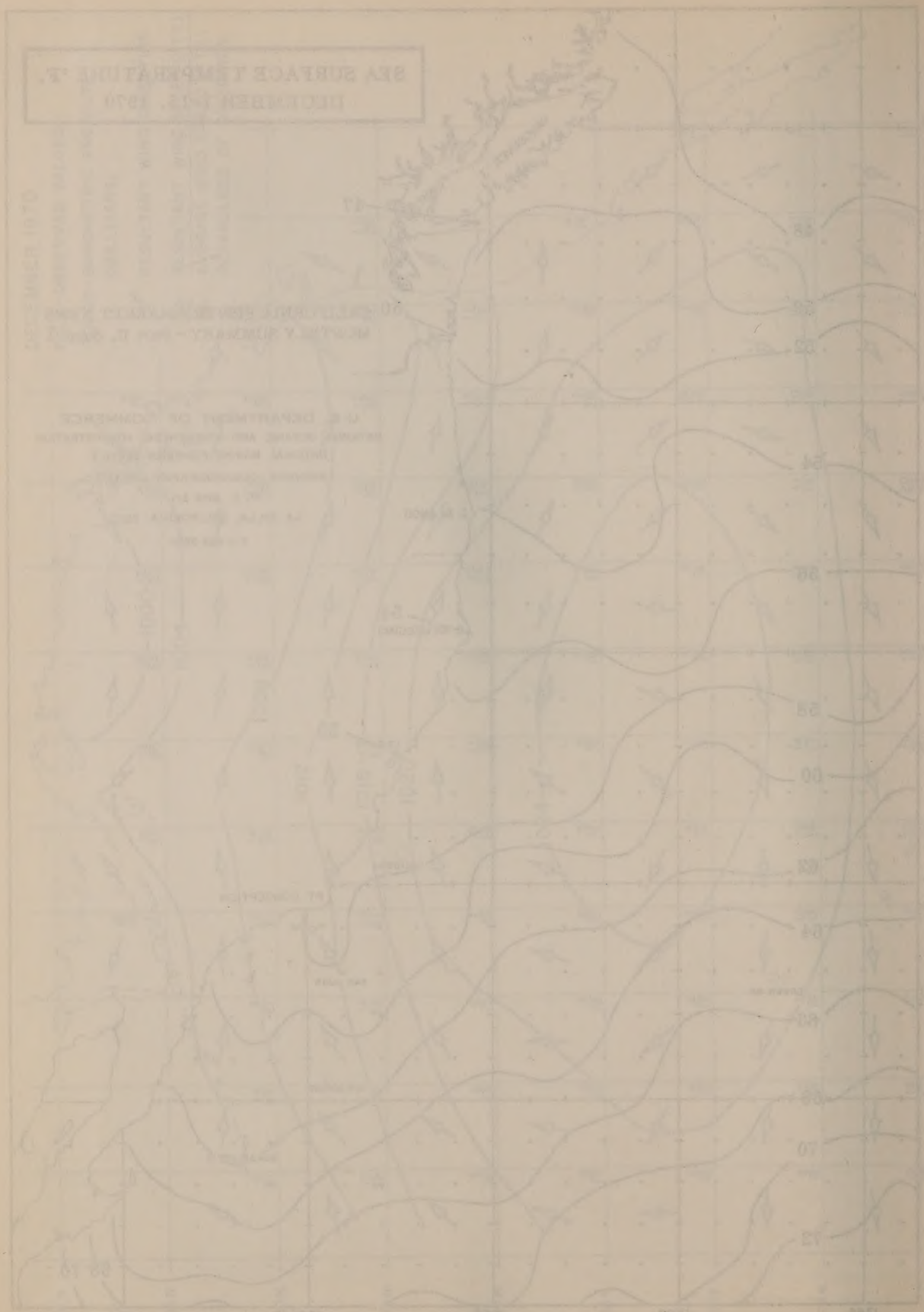

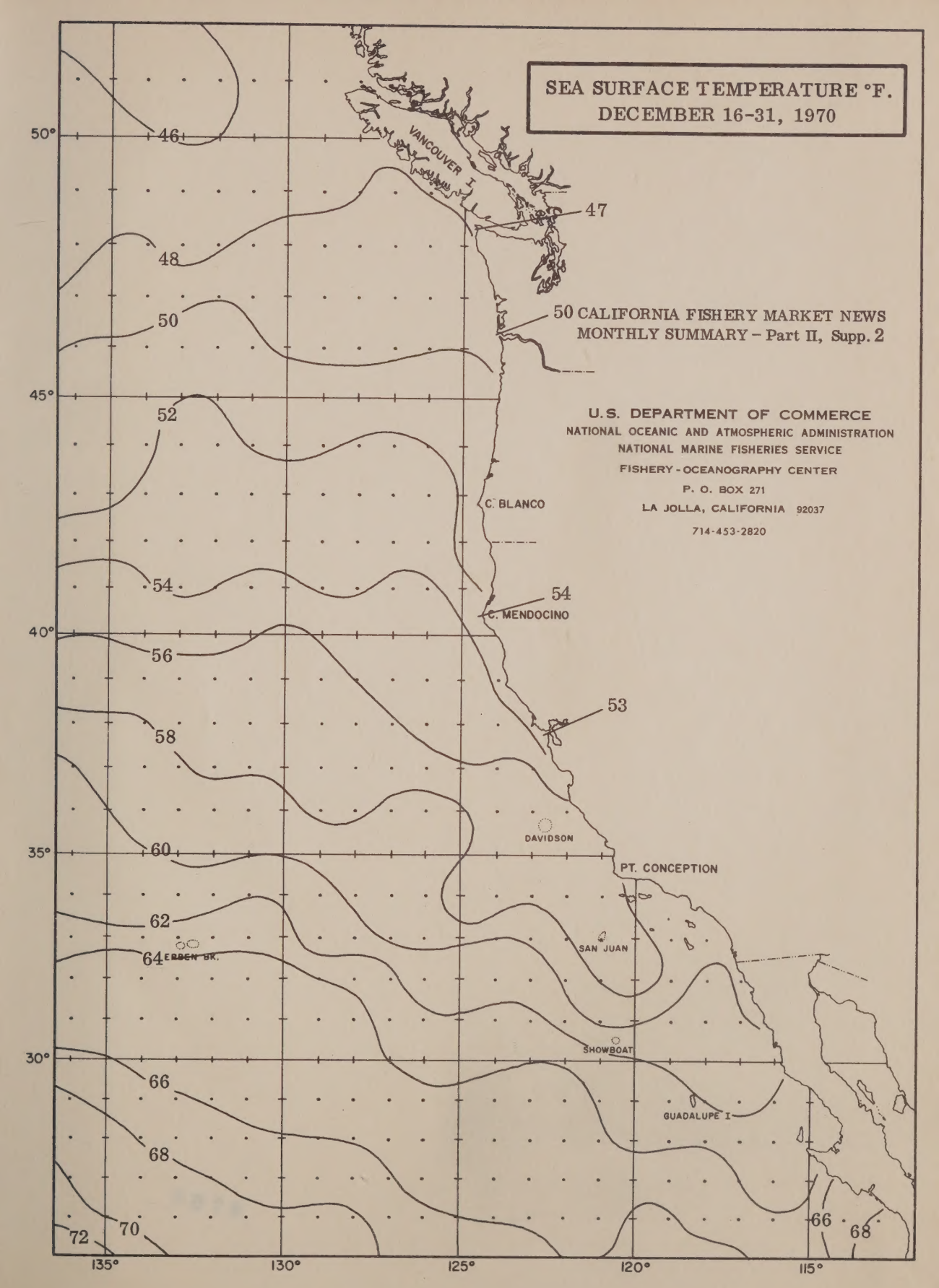
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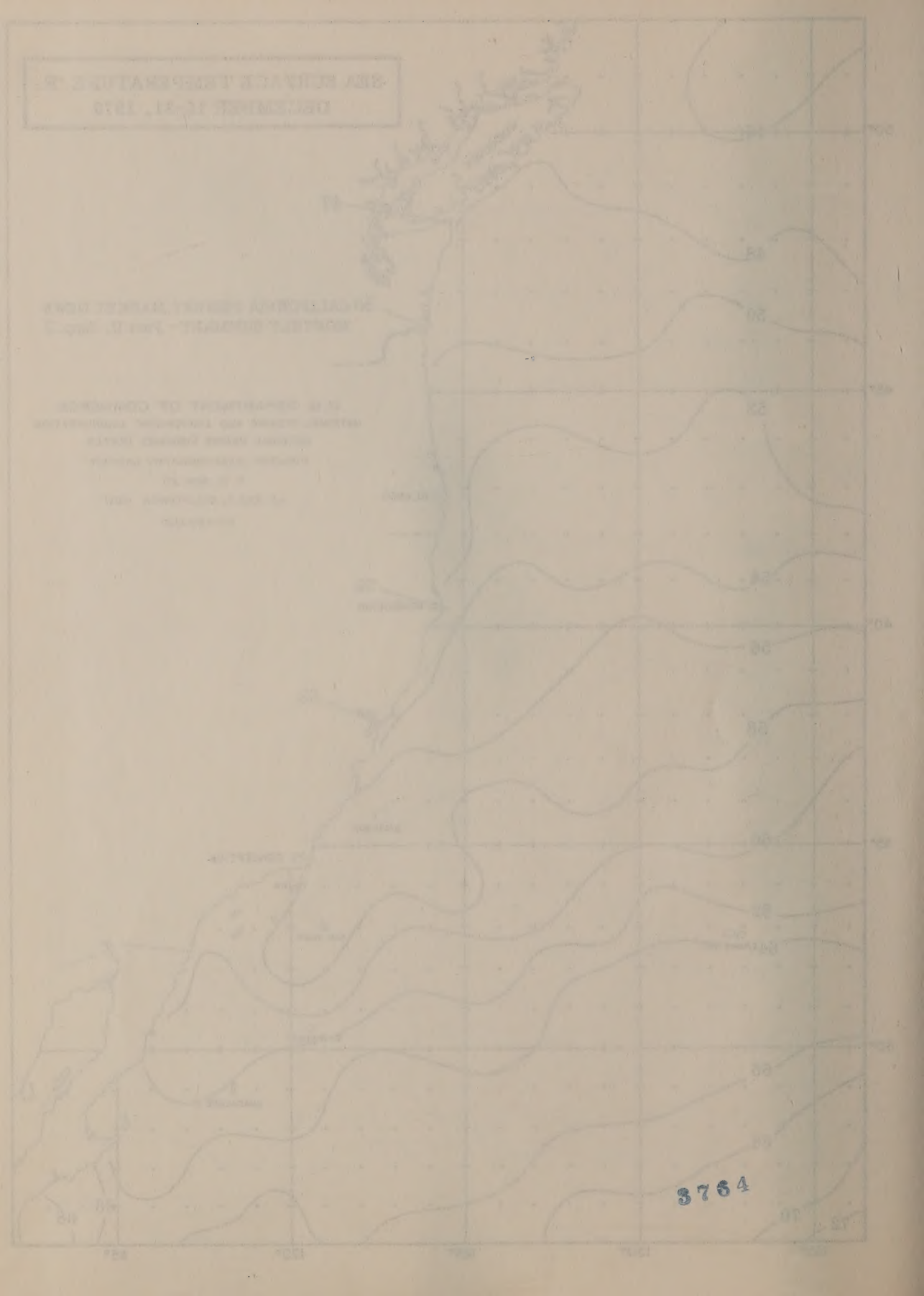

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